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Remarks

In view of the foregoing amendments and these accompanying remarks, it is respectfully requested that this application be reconsidered.

Claim 28 has been amended in order to more particularly point out and distinctly claim the scope of the invention. In so doing it is believed that the rejection under 35 USC 132 has been obviated and it is requested that that the rejection be withdrawn.

Applicant has considered the prior art rejections and respectfully disagrees with the Examiner. Reference is made to the accompanying Declaration of Doron Spitz. From these reported test results, it is apparent that the herein claimed invention has substantial benefits over the prior art batteries.

At the outset, it should be clarified that the invention refers to a rechargeable, secondary battery of Silver-Zinc system, which utilizes flexible electrodes made out of compacted powder the particles of which are not sintered nor bound or glued therebetween. The active material is compacted to the required porosity, which is defined for the application. The electrodes are wrapped up in flexible separators, which insulate the electrodes one from another. The active materials of the electrodes are Zn oxide and Ag (when the battery discharges). The substrates could be made out of a metallic grid or made out of woven conductive fabric. The electrodes are installed in a casing (as they can not stand alone because they will dissipate) filled with an electrolyte, the ions of which can diffuse through the pores of the separator to approach the particles of the active material and thus enabling the electrochemical reaction to take place during charging and discharging of the cell. The electrodes can be in a flat or spiral (wound up) configuration. One of the most important features of the invention is using a means for applying pressure on the electrodes, normal to its plane. In one embodiment a spring, pressing on the electrodes is employed as such a means. The pressure is required in order to maintain the physical contact between the particles of the active materials themselves and also between the particles and the substrate. This pressure is necessary in order to avoid possible change of volume of the active material caused by the change of its density (bulk & absolute) during the electrochemical reaction. Due to this change of the volume there is a danger that the structural integrity of the electrodes will be deteriorated and as a result the electronic

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conductivity will be reduced, as well as the cell's efficiency. The present invention seeks to compensate for these volume changes by applying pressure to the electrodes and thus to counteract the electrode's volume changes. The means for applying pressure can be not only a dedicated spring fixed to the casing and capable of pressing the walls (as seen in Fig.1). It can be also the elasticity of the casing itself, which would act on the electrodes, if they were densely packed within the casing (this is applicable also to spirally wound electrodes shown in Fig.3). Furthermore, in one of the embodiments the separator can be made of material, which when immersed in the electrolyte swallows during the functioning of the cell, and this can also cause pressure on the particles of the active material and thus to contribute to the desired effect, i.e. to the counteracting to the electrode's volume changes.

It might be true that nowhere in the specification as filed or as amended is there an explicit indication that the pressure is applied in a direction substantially perpendicular to the electrodes. It is believed, however, that this is implicit from the description of the spring, etc. As mentioned above and in the Specification, the present invention seeks to compensate for volume changes by intentionally applying pressure to the electrodes and thus to counteract the electrode's volume changes. It may be concluded that the pressure has to be applied perpendicularly to the electrodes in order to achieve this desired effect. Therefore, as previously presented Claim 28 did not contain new matter and was supported by the Specification. Nonetheless, the language of Claim 28 is now amended to delete reference to the direction of the pressure and to instead mention that the pressure is to counteract the electrode's volume changes. This amendment is fully supported by the specification as filed, see for example page 3, lines 21-23, page 4, lines 4-8 or by amendment dated September 13, 2004 to the Specification pages 4, line 15 and page 10, lines 4 and 21.

Honda (US Patent 5,580,676) discloses a Li-ion or Li-polymer system, which employs rigid electrodes. In this system the electrodes do not change their volume due to electrochemical reaction. Therefore, there is no need for any means for counteracting to such changes and for applying pressure on the electrodes. Honda does not teach or even suggest that pressure is applied to the electrodes. To the contrary, external pressure is not required and is not applied.

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Honda does not have any explicit or implicit indication that external pressure is applied to the electrodes. Therefore, it cannot anticipate or obviate the instant invention.

As taught by Honda, the electrode groups are formed by "packing each of plural cathode plates with a separator 4 as a sheet ... inserting anode plates 5 ..." (Column 3, lines 56- 62). In contradistinction, the herein claimed and described cell has "flat electrodes encased in said housing and immersed within an electrolyte, at least one of said electrodes including an electrically conductive substrate and compressed particles of an active material deployed on said substrate." Therefore, Honda is not at all applicable as he uses an entirely different type of electrode.

Regarding Claims 36,42-45, Honda discloses a system, in which is employed either a polypropylene or a polyethylene separator. It is well-established fact that these materials do not swallow when immersed in electrolyte and therefore a separator made of these materials is not able to apply pressure on electrodes. Applicant cites in this connection US Patent 6372379, in which is described a micro porous separator for Ag-Zn batteries. This separator is made of a polyolefin polymer. It is explicitly stated in example 6 that this separator does not swell in KOH.

In contrast to the cellophane separators which swells and acts as a spring, (as in the present invention), the polyolefin polymer separator employed in Honda does not swell (as known in the art and as for example shown in US Patent 6372379).

Regarding Claim 41 there is no disclosure or suggestion in Honda that the battery casing 2 is elastic and that it is designed for and is capable of applying pressure on the electrodes.

Claim 34 depends on claim 28 and claim 28 now explicitly indicates how the pressure is applied. The manner in which pressure is applied in the present invention has nothing to do with the manner of applying pressure in Pyszcek (US Patent 5,756,229). The purpose of applying pressure in Pyszcek is to prevent axial displacement of the wound electrode assembly, which might be

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caused by a shock. Pyszcek employs for this purpose resilient elements 52 placed between separator assembly 30 and upper and lower end walls 16 and 18. These elements comprise wave springs, which are selected intentionally to resiliently dissipate (to shock absorb) mechanical forces acting to otherwise cause axially movement of the spirally wound assembly 30. In other words, the pressure means of Pyszcek is intended to exert pressure along the longitudinal axis of the battery. Due to this axial direction pressure will not bring the particles of active material in contact as required for counteracting the electrode's volume changes. Thus Pyszcek would not meet the requirement of reasonable expectation of success.

As explained by Pyszcek "Being spirally-wound, anchoring of the electrode and separator assembly 30 may be limited to the periphery thereof. Thus the central portion of the assembly 30 may tend to telescope outwardly under mechanical shocks and be damaged. In order to prevent this from occurring, in accordance with the present invention a resilient member is disposed between the assembly 30 and at least one but preferably each of the end walls 16 and 18 for resiliently dissipating (shock absorbing mechanical forces ..." (Column 2, line 59 - Column 3, line 3). In contradistinction, the herein invention discloses and claims a "means for applying pressure on said electrodes so as to counteract the electrode's volume changes resulting from electrochemical reaction between the electrolyte and the active material." Whereas Pyszcek is concerned with the assembly unwinding due to a mechanical shock, Applicant is concerned about overcoming the volume changes of the active materials induced by the electrochemical reaction.

Furthermore, Pyszcek is not combinable with Honda, since Honda discloses a cell with flat, rigid electrodes, while Pyszcek describes a cell with flexible, wound electrodes. Further, even taken together, as explained above, the individuals references do not disclose or suggest some of the salient elements of the inventions, so certainly a combination of them would still be lacking these claimed elements of the instant invention.

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There is no evidence that the references contain some teaching, suggestion or motivation to combine them. On the contrary, the cited references refer to different types of electrodes (Honda to rigid electrodes and Pyszcek to flexible electrodes) and therefore one skilled in the art would not consider their teachings combinable. Furthermore, neither Honda nor Peszezel deal with the problem of counteracting the volume changes of the electrodes caused by the electrochemical reactions of the active materials and therefore they do not address the same problem as the present invention.

The resilient element of Pyszcek does not indirectly exert pressure to the electrode in a perpendicular direction. Instead, in Pyszcek this resilient element assists to maintain structural rigidity of the cell, in order to avoid its deterioration, which might be caused by a mechanical shock. Pyszcek does not contain any implicit or explicit indication that this resilient element is designed for or is capable of maintaining contact between particles of active material, so as to counteract the volume changes of electrodes due to electrochemical reaction.

Claim 35 is dependent from claim 28. As just stated above the means for applying pressure employed in Pyszcek is devoted for a different purpose and is designed differently than the herein claimed invention. It is not clear why and in which connection Takamura (US Patent 4,407,907) is cited in the end of item 5 on page 8 of the Office Action.

Claims 29, 30 and 32 are dependent on claim 28. Schulze (US Patent 5,993,618) employs woven carbon fiber with a thickness of 0.36 mm. In the present invention, the substrate is made of carbon fabric with a thickness of 0.01-0.1 mm. It is not clear how the thickness of the fabric in Schulze anticipates the present invention. Schulze employs finished catalyzed electrodes with a thickness of 0.4-0.5 mm (Column 7, lines 14- 23) and does not mention a finished catalyzed electrode with a thickness ranging from 0.04 to 0.14 mm. In the present invention the thickness of each electrode is

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0.8-10 mm. Therefore, the thickness of electrodes in Schulze does not anticipate or obviate the present invention.

Claim 31 also depends on claim 28. Aihara (US Publication 2003/0170536) describes a battery, which is designed differently from the present invention. Aihara does not employ flexible electrodes. In Aihara I. the electrodes are directly bonded to a common adhesive resin layer, which separates between them. The electrodes and the separator constitute an integral, rigid body. In Honda electrodes are separated one from another by respective separators and electrodes are not united in an integral rigid body. Therefore Honda and Aihara are not combinable in principle not to mention the fact that neither Aihara nor Honda contains any explicit indication about the desirability of such a combination. As to Aihara reference, the Applicant contends that it is irrelevant to the present invention, since it does not refer to a cell with a flexible electrodes (as the present invention). Merely the statement that electrodes of Aihara can be Ag-Zn electrodes is insufficient for obviating the present cell, which is defined by the particular design claimed in claim 28. None of the features found in this claim are present in Aihara.

Claim 33 is also dependent on claim 28. The sintered powder material mentioned in Column 1, lines 20 -30, of Takamura has nothing to do with the active material employed in the present invention. The sintered powder material of Takamura (mentioned at Column 1, lines 20-30) is not active material, which participates in the electrochemical reaction, but organic (filling) material, which is intended for increasing porosity of the electrodes. This material is not intended for or capable of participating in the electrochemical reaction.

Claims 38 and 46 are both dependent claims. Claim 38 refers to material of the substrate, which is made of woven carbon fabric, which fibers are coated by a metal coating. Takamura (Col.1, lines 48-55) refers not to a substrate, but to active material of the electrode, which is made either of active carbon powder carrying a catalyst coated by metal or is made from a non woven fabric, which is not

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coated. Takamura does not anticipate the substrate material of the present invention. Claim 46 of the present invention refers to active material of the electrodes. This material is carbon or Silver and it does not carry a catalyst (as in Takamura).

Claims 39 and 40 are both dependent claims, and refer to metallic coating on carbon fibers of a woven fabric of the substrate. Faris (US Publication 2003/0143446) discloses a metallic coating on a back layer of low-density plastic material. This coating is integral with the plastic layer and functions as active material of the electrode. In the present invention, the active material is granular powder, which is not integral with the substrate. In the present invention, the substrate is not a rigid plastic layer, but flexible woven carbon fabric, the fibers of which are coated by metallic coating. Thus, Faris is believed to not be applicable at all.

Therefore, the claims are novel over the cited prior art and not anticipated or obviated, and the rejections under 35 USC 103 should be withdrawn.

It is, therefore, requested that a Notice of Allowance issue and that all of the pending claims be allowed.

Dated: June 30, 2005

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